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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/805,205	03/22/2004	Eiji Ogawa	Q80556	1127
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SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			EXAMINER ABRAHAM, SALIEU M	
			ART UNIT 3768	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/805,205

Applicant(s)

OGAWA, EIJI

Examiner

Salieu M. Abraham

Art Unit

3768

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 August 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,5,6,9,10,13-15 and 18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,5,6,9,10,13-15 and 18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

Claim Rejections - 35 USC § 112

1. The following is a quotation of the sixth paragraph of 35 U.S.C. 112:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

(Amended July 24, 1965, Public Law 89-83, sec. 9, 79 Stat. 261; Nov. 14, 1975, Public Law 94-131, sec. 7, 89 Stat. 691.)

a. A claim limitation will invoke 35 U.S.C. 112, sixth paragraph if it passes the following three-pronged test:

- i. The claim limitations **must use** the phrase “means for” or “step for”,
- ii. The phrase “means for” or “step for” **must be modified** by functional language, and
- iii. The phrase “means for” or “step for” **must not be modified** by sufficient structure, material or acts for achieving the specified function.

2. Claim 1 invokes 35 U.S.C. 112, sixth paragraph, as it meets all the requirements of the three-pronged test above. Therefore, the following claim limitations are being treated as invoking 35 U.S.C. 112, sixth paragraph in this action for art rejection purposes:

In Reference to Claim 1:

a. drive signal generating means for generating drive signals for respectively driving said plural ultrasonic transducers;

b. transmission control means for controlling said drive signal generating means such that ultrasonic waves to be transmitted from said plural ultrasonic transducers form a transmission beam to be transmitted in at least one direction;

c. reception control means for performing reception focusing processing on plural detection signals obtained based on ultrasonic waves received by said plural ultrasonic transducers so as to form a reception focal point in at least one direction thereby forming a reception beam; and

d. control means for changing directivity of plural ultrasonic components constituting the transmission beam in accordance with a sound ray direction in which the transmission beam is transmitted and/or changing directivity of plural ultrasonic components constituting the reception beam in accordance with a sound ray direction in which the reception focal point of the receiving beam is formed.

Have been interpreted as covering the following equivalents as described and when viewed in light of the specification:

a. the specified means could refer to the following drive signal generating equivalents: a pulser(s), waveform or ultrasonic pulse generator, (ultrasonic) transmitter/transmit unit, transmit beam former, an external (multifunctional ultrasound) imaging instrument with drive pulse circuitry (page 1, line 25, page, lines 2-7 and page 16, lines 16-20),

b. the specified means could refer to the following transmission control means equivalents: transmit beam former or transmit beam steering circuit (page 15 lines 22-27 and page 16, lines 1-15),

c. the specified means could refer to the following reception control means equivalents: receive beam former or receive beam steering circuit, (page 17 lines 21-27 and page 18, lines 1-18),

d. the specified means could refer to the following control means for changing directivity of plural ultrasonic components equivalents: a master controller, system control/timing unit, (central) control system/unit/electronics (i.e. microprocessors, digital signal processors or DSPs, and optional computer code) which manages/adjusts system components and parameters which determine beam phasing (focusing upon transmit or/and receive and steering <applicant's directivity and sound ray direction>) characteristics (see applicant's scanning unit, page 15 lines 15-21).

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-2, 5-6, 9-10, 13-15 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by US Pat No. 6,066,099 to Thomenius (Thomenius).

In Reference to Claim 1

Thomenius teaches:

I. An ultrasonic transmitting and receiving apparatus comprising: an ultrasonic transducer array including plural ultrasonic transducers for transmitting ultrasonic waves and receiving ultrasonic waves reflected from an object to be inspected (see figure1, reference marks **10** and **12** and column 3, lines 36-45); other teachings include, a

a. drive signal generating means for generating drive signals for respectively driving said plural ultrasonic transducers (see figure1, reference mark **14** and column 3, lines 39-41);

b. transmission control means for controlling said drive signal generating means such that ultrasonic waves to be transmitted from said plural ultrasonic

transducers form **at least one** transmission beam to be transmitted in at least one direction (see figure1, reference mark **26** and column 3, lines 62-64);

c. reception control means for performing reception focusing processing on plural detection signals obtained based on ultrasonic waves received by said plural ultrasonic transducers so as to form **at least one** reception focal point in at least one direction thereby forming **at least one** reception beam; and (see figure1, reference mark **30** and column 4, lines **30-67** and column 5, lines 1-8);

d. control means for changing directivity of plural ultrasonic components constituting **the at least one** transmission beam in accordance with **at least one** sound ray direction in which **the at least one** transmission beam is transmitted and/or changing directivity of plural ultrasonic components constituting **the at least one** reception beam in accordance with **at least one** sound ray direction in which the **at least one** reception focal point of the **at least one reception** beam is formed (see figure1, reference mark **20** and column 3, lines 49-66, column 4, lines 50-65 and column 5, lines 1-15);

(e) wherein said control means changes the directivity of **each ultrasonic component** by changing a number of drive signals to be simultaneously applied to adjacent ultrasonic transducers for forming the ultrasonic component based on a selected one of directivity control patterns (see fig. 1, reference mark **20** , abstract, column 1, lines 33-46, column 2, lines 59-67, and column 3, lines 1-13)

stored in a transmission delay pattern storage unit (see fig. 1, reference marks **14 and 20**), and/or changes the directivity of each ultrasonic component by changing a number of detection signals simultaneously obtained and to be used for forming the ultrasonic component based on a selected one of directivity control patterns stored in a reception delay pattern storage unit. (see fig. 1, reference marks **16 and 20**)

In Reference to Claim 2

Claim 2 states: "An ultrasonic transmitting and receiving apparatus according to claim 1, wherein said control means makes the directivity of said ultrasonic components stronger as an angle formed by a front direction of said ultrasonic transducer array and said **at least one** sound ray direction becomes smaller."

Thomenius has been shown to teach all the claim limitations with respect to claim 1. Thomenius further teaches the step "wherein said control means makes the directivity of said ultrasonic components stronger as an angle formed by a front direction of said ultrasonic transducer array and said **at least one** sound ray direction becomes smaller" (see figure 3 column 1, lines 43-46, column 3, lines 1-14, lines 60-67, column 4 lines 1-36 and 50-64, column 5, lines 29-41 and 46, and column 6, lines 28-44). The cited material in brackets all teach measures taken to orient or direct a resulting ultrasound beam according to the transmitting

and receiving apparatus of claim 1 along with side lobe suppression (column 5, lines 29-41 and 46, and column 6, lines 28-44). These requirements are given by the applicant in the disclosure as being necessary for strengthening the directivity of the resulting individual waves from each ultrasound array element (**ultrasonic components**) along with a corresponding reduction in "an angle formed by a front direction of said ultrasonic transducer array and said sound ray direction" (see figures 1A and 1B and page 9, lines 22-27 in specification).

In Reference to Claims 5 and 6

Thomenius teaches:

"An ultrasonic transmitting and receiving apparatus according to claim 1, wherein said control means performs weighting on the **plural drive signals (for claim 5)** and the **drive signals (for claim 6)** to be simultaneously applied to the adjacent ultrasonic transducers for forming said ultrasonic component." (see fig. 1, reference mark **14**, abstract, column 2, lines 59-67, and column 3, lines 1-13, and column 4, lines 14-21).

In Reference to Claim 9

Thomenius teaches:

"An ultrasonic transmitting and receiving apparatus according to claim 1, wherein said

reception control means performs reception focusing processing on plural directions in which the at least one transmission beam is transmitted (see claim 9/column 12, lines 26-27, 36-40, and 46-52) so as to form reception focal points in the plural directions.”
(see claim 1/column 10, lines 60-65, claim1/column 11, lines 23-29).

In Reference to Claims 10 and 13

Thomenius has been shown to teach all the claim limitations with respect to claims 2-5 respectively, and, additionally, Thomenius has been shown to teach the step “wherein said reception control means performs reception focusing processing on plural directions in which the at least one transmission beam is transmitted so as to form reception focal points in the plural directions” as described above (see claim 9 rejection).

In Reference to Claim 14

Thomenius teaches:

“An ultrasonic transmitting and receiving apparatus according to claim 1, wherein said reception control means performs reception focusing processing on plural directions in which the transmission beams are transmitted so as to form reception focal points in the plural directions, respectively.” (see abstract, column 2, lines 59-67, column 3, lines 60-62, and column 4, lines 30-49 and claims 1 and 5).

In Reference to Claims 15 and 18

Thomenius in has been shown to teach all the claim limitations with respect to claims 2-5 respectively, and, additionally, Thomenius has been shown to teach the step "wherein reception control means performs reception focusing processing on plural directions in which the plural transmission beams are transmitted so as to form reception focal points in the plural directions, respectively" as described above (see claim 14 rejection).

Response to Arguments/Remarks

5. Examiner acknowledges Applicant's claim to foreign priority as being complete. All certified priority document copies are in order and the correction is duly made and noted in this Office Action.

6. Applicant's arguments with regard to claims 1-2, 5-6, 9-10, 13-15 and 18 filed August 20 and 29, 2007 respectively, have been fully considered, but they are not persuasive.

7. With respect to Applicant's amendments regarding claim 1, Examiner acknowledges the amended claim to include both single and multi-beam transmission and reception, the latter described in the second embodiment of the application, and canceled claim 3

and 4 subject matter.

8. Examiner, further acknowledges Applicant's amendments regarding claims 9, 10 and 13, supported by figures 12A and 12B and their corresponding description (page 28, line 21 to page 29, line 21) in Applicant's application.

9. Examiner respectfully disagrees with Applicant's assertion that Thomenius' system does not allow for single and multi-beam transmission and reception (see column 3, lines 1-14 and figures 3 and 4) and that unit beam directivity is not disclosed (see claim 5 and columns 3 lines 36-67 and 4, lines 1-37).

Furthermore, with respect to Applicant's argument that Thomenius does not address the limitations below, Examiner directs Applicant to the cited reference locations and the ensuing Examiner arguments below.

a) the directivity of each of the ultrasonic components, which constitute one ultrasonic beam, is changed by changing a number of drive signals to be simultaneously applied to adjacent ultrasonic transducers, (see claim 5 and columns 3 lines 36-67 and 4, lines 1-37) and

b) the directivity of each ultrasonic component is changed by changing a number of detection signals simultaneously obtained and to be used for forming the ultrasonic

component (see claims 1 and 5, and column 4, lines 42-67).

At the crux of Applicant's argument is that the Thomenius reference does not allow for unit beam directivity customization in producing a single or multiple ultrasound beam(s) of a specified sound ray direction and which minimizes side-lobed induced error based on the composite (ultrasound) beam direction. As pointed out above, Thomenius does disclose single and multi-beam generation capability as well as unit beam directivity. Furthermore, the convolution of the Thomenius apodization function with the "pre-element presentation" pulses, accomplishes a very close, if not identical function as Applicant's pulsing schemes depicted for embodiments 1 (see) and 2 (see). That is, the apodization function is applied per pulse for presentation to a selected element and this in turn produces a unit beam with (apodization function) encoded directivity and, correspondingly, main and/or side-lobe contribution (see figure 2 and column 4, lines 1-30). The individual contributions of each unit beam constitute the composite ultrasound beam and its echoes are reception-focus received and processed by the receiver component of Thomenius' system as described in column 4, lines 50-67.

Note: the pulse train pattern and characteristics are fully adjustable and controlled by the system Master Controller (see figure 1, columns 3, lines 36-67 and 4, lines 50-67). Therefore, in light of these arguments and Examiner's discussion in the rejection of claim 2, Applicant's proposed invention does not distinguish and would not be patentable over Thomenius.

10. As a result the prior Office Action is maintained and now made final. The Office Action is changed only to include subject matter maintaining the same basis as the original action and added for clarity of Examiner's position.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Bertora al., Drukarey et al., Lamarre et al. and Song et al., have been included because they respectively encompass phased array and other ultrasound imaging systems and methods which find utility in side lobe reduction and/or which employ multidimensional (2D, 3D), high speed/high resolution apparatus and

techniques similar to those described by the applicant for the proposed invention.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Salieu M. Abraham whose telephone number is (571) 270-1990. The examiner can normally be reached on Monday through Thursday 9:30 am - 7:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Casler can be reached on (571) 272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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